# Methodology

## Data Sources Used in This Report

### Overview of Data Sources

To comprehensively understand the impact of CVD in Nebraska, a variety of data were selected to look at multiple aspects of CVD and its associated risk factors. Within this report, a total of 14 Nebraska data sources were used to examine one or more aspects of CVD. These data sources contained information on mortality, medical care and expenses, emergency medical services response times, CVD prevalence, barriers to cardiovascular health, and adult and youth behaviors and knowledge related to each of the seven preventable risk factors for CVD presented within this report. A variety of national statistics were also presented within this report (and cited accordingly).

### Mortality Data

Mortality data in Nebraska are collected on a yearly basis and are based on data from individual death certificates. These death certificates are collected and compiled by the Nebraska Office of Vital Statistics. These data include information on a variety of attributes of the deceased (including age, race/ethnicity, gender, place of residence, and primary and secondary causes of death).

Mortality data used in this report are from years 1979-2001. These data are coded using the International Classification of Disease (ICD), the source for coding mortality data by cause. Data collected during years 1979 to 1998 used the 9th revision of the ICD (ICD-9). In 1999, the ICD updated its coding system to the 10th revision (ICD-10). To compare data that were coded with the ICD-9 codes to data that were coded with the ICD-10 codes, comparability ratios must be applied to all ICD-9 data. Subsequently, all data presented within this report that were coded using the ICD-9 codes (aside from total CVD mortality which has virtually identical comparison), were modified to allow for comparability to ICD-10 data (unless noted). For additional information on ICD comparability ratios and methods, view the National Center for Health Statistics website at <http://www.cdc.gov/nchs/datawh/nchsdefs/Comparability%20Ratio.htm>. The cause of death mortality codes and comparability ratios used in this report are included in Table 1.

### Nebraska Hospital Discharge Data

Information on each hospital discharge is reported from acute care hospitals in Nebraska to the Nebraska Association of Hospitals and Health Systems (NAHHS). This information is reported by hospitals using the Uniform Billing Form (UB-92) and is transmitted electronically to the Nebraska Hospital Information System (NHIS) at NAHHS, using the DataTrac software. Ultimately the information is acquired by the Nebraska Health and Human Services System (NHHSS) from NAHHS.

There are two types of hospital discharge records available in Nebraska, emergency department (ER) and inpatient (IP). This report contains information from both records. Furthermore, these data are separated using an encrypted patient identifier (provided to NHHSS by NHIS) to eliminate the duplication of records by one individual patient. Hospital discharge records contain information on the date of admission, date of discharge, patient's age, gender, county of residence, and primary and secondary ICD-9-CM diagnosis codes. Information is not available on the race or ethnicity of the patient.

There are two limitations of these data. First, the number of records reported by acute care hospitals to the NHIS is lower than the number or records the same hospitals report to the NHHSS annually, indicating incomplete data. As a result, records are reported as estimates (that underestimate the true values)

**Table 1: International Classification of Disease (ICD) Mortality Codes Used within this Report**

| Cause of Death | ICD-9 (years 1979-1998) | ICD-10 (years 1999-2001) | Comparability Ratio* |
|---|---|---|---|
| Total CVD | 390-459 | I00-I99 | 1.0000 |
| Heart Disease | 390-398, 402, 404, 410-429 | I00-I09, I11, I13, I20-I51 | 0.9858 |
| Coronary Heart Disease | 410-414, 429.2 | I20-I25 | 0.9990 |
| Heart Failure | 428 | I50 | 1.0410 |
| Sudden Cardiac Death | NA | I00-I09, I11, I13, I20-I51, Q20-Q24** | NA |
| Stroke | 430-434, 436-438 | I60-I69 | 1.0588 |
| High Blood Pressure | 401-404 | I10-I15 | -^ |
| Alzheimer's Disease | NA | G30 | NA |
| Birth Defects | NA | Q00-Q99 | NA |
| Cancer | NA | C00-C97 | NA |
| Chronic Lung Disease | NA | J44, J47 | NA |
| Diabetes | NA | E10-E14 | NA |
| Homicide | NA | X85-Y09, Y87.1 | NA |
| Pneumonia | NA | J12-J18 | NA |
| Suicide | NA | X60-X84, Y87.0 | NA |
| Unintentional Injuries | NA | V01-X59, Y85-Y86 | NA |

*The ratio that must be applied to data coded through ICD-9 to allow for comparison to data coded through ICD-10
**Sudden Cardiac Deaths must include these ICD codes and must have occurred in one of the following locations: outpatient care, emergency department, residence, nursing home, or other out of hospital death
^High Blood Pressure comparability ratio is unknown, thus, ICD-9 data in this report were unmodified
NA: this information was not used in this report
Source: National Center for Health Statistics (NCHS)

rather than census figures. The following represents the percentage of completeness for each year of the Nebraska Hospital Discharge Data (calculated by dividing the number of actual cases in the database by the number of cases reported to the NHIS): year (% inpatient records, % ER records): 1996 (83%, 44%), 1997 (83%, 52%), 1998 (83%, 65%), 1999 (87%, 70%), 2000 (87%, 75%), 2001 (82%, 76%).

The second limitation is that Nebraska residents receiving care outside the State of Nebraska are not included in the database. Since the rate and trend of migration for medical care is unknown, the true number of hospitalizations and ER visits for Nebraska residents is beyond speculation. Particular caution should be used when comparing hospitalization rates geographically, since residents of some counties may be more likely than residents in other counties to receive their medical care out of state.

## Nebraska Medicaid Claims Data (NMCD)

The Medicaid program is a partnership of federal and state government that funds approved health care and related services for individuals who meet eligibility requirements. Physicians and other health care providers submit information to the state or to insurance companies contracting with the state.

NMCD data represent inpatient, outpatient, and pharmacy records for Nebraska Medicaid enrollees. They also provide information on the date of the medical encounter, the enrollee's age, gender, and race/ethnicity. Within this report, all NMCD represent people enrolled in the Nebraska Medicaid program during the calendar year (CY) 2001. To be included within the database, the enrollee must have been a resident of Nebraska, been born before the end of the CY 2001, and not have a gender listed as "unborn." Services for individuals with "unborn" as gender were generally services for expectant mothers who were Medicaid eligible because of their unborn child. They were excluded because the age of these individuals is generally listed as zero, but the services performed are generally for an adult.

The results listed in this report were obtained using Medicaid claims and encounters that were accessed through the Medicaid MEDSTAT DataScan data warehouse through the Nebraska Medicaid Managed Care Program. While the results listed in this report are population parameters (not estimates), the accuracy of the results may be limited by rounding, missing or erroneous records, or other limitations of the administrative data source.

Prescription data for Medicaid enrollees is presented within this report. CVD-related drug prescriptions include antihypertensive and diuretics, antihyperlipidemic, antithrombotics, thrombotics, and not specified cardiac drugs. Vitamin supplements and "CVD devices and non-drugs" are included in the number that received a CVD-related drug prescription but are excluded from the CVD-related drug costs.

While most were covered for the entire year, some Nebraska Medicaid enrollees were covered for only part of CY 2001. As a result, we adjusted the Medicaid population to reflect eligibility years (or the number of enrollees if enrollees were enrolled for 12 months). To do this, we summed the number of months that each enrollee was covered by Medicaid during 2001 and divided them by 12. Eligibility years (which is commonly used in similar analysis) creates denominator values that are more conducive to calculating representative rates.

In 2001, 244,802 Nebraska residents were enrolled in Nebraska's Medicaid system for any amount of time. However, this population converted to 191,055 eligibility years, indicating that a large number of enrollees were enrolled for less than 12 months.

The numbers, rates, and costs of hospitalization presented within this section may slightly under represent the actual numbers that occurred within Nebraska's Medicaid population (due to the selection of specific billing codes during analysis). In contrast, the total medical encounters contain all encounters, including those that may be missing from the hospitalization statistics.

Death certificate data in Nebraska were linked with the Nebraska Medicaid Claims data to identify which CVD deaths in 2001 occurred among Medicaid enrollees. The identification information from the 5,763 Nebraska CVD deaths in 2001 was provided to MEDSTAT for reference against the identification information for all Medicaid enrollees. Deaths due to CVD among Medicaid enrollees represent only those that were enrolled in Medicaid during their time of death.

For additional information on the Nebraska Medicaid Claims Data please contact the Nebraska Managed Care Epidemiologist of the Nebraska Medicaid Managed Care Program at (402) 471-0137.

## Nebraska Medicare Claims Data

The Centers for Medicare and Medicaid Services (CMS) administers the Medicare program, as well as works with states to administer Medicaid, the State Children's Health Insurance Program (SCHIP), and health insurance portability standards. The quality improvement organization (QIO) in Nebraska contracting with CMS to improve the quality of health care is CIMRO of Nebraska.

The data in this report represent a sample of hospitalization records for Nebraska Medicare beneficiaries that are drawn by the Clinical Data Abstraction Centers (CDAC) for CMS. This sample consists of hospitalization records for Nebraska Medicare beneficiaries treated in Nebraska hospitals. For measuring beta-blocker at admission, a sample of 36 records was drawn for acute myocardial infarction (AMI) discharges without beta-blocker contraindications at admission. For measuring beta-blocker at discharge, a sample of 75 records was drawn for AMI discharge without beta-blocker contraindications at admission records. For more information on CMS or quality of care for Nebraska Medicare beneficiaries, please contact CIMRO of Nebraska at 402-476-1399.

**Table 2: International Classification of Disease Clinical Modification Codes from the 9th revision (ICD-9-CM) Used within this Report for Hospitalization and Medical Care Analysis**

| Cause of Medical Care | ICD-9-CM Codes | Cause of Medical Care, cont. | ICD-9-CM Codes |
|---|---|---|---|
| Total CVD | 390-459 | Chronic Obstruction Pulmonary Disease | 490-496 |
| Heart Disease | 390-398, 402, 404, 410-429 | Diabetes | 250 |
| Coronary Heart Disease | 410-414, 429.2 | Digestive System Disorders | 530-579 |
| Heart Failure | 428 | Infections and Paracitic Disease | 001-139, 480-487 |
| Stroke | 430-434, 436-438 | Injuries | 800-959 |
| High Blood Pressure | 401-404 | Mental Health | 290-319 |
| Cancer | 140-239 | Pregnancy and Childbirth | 630-676 |

Source: Nebraska Health and Human Services System

## Nebraska Emergency Medical Services Response Time Data

The Nebraska emergency medical services (EMS) response time data contain information on the time from dispatch to the arrival at the health care facility. Each time an EMS transport is completed, the EMS provider completes a form and sends it into the Nebraska Health and Human Services System for entry into a database. Data within the database represents all EMS transports, including both residents and non-residents of Nebraska.

The EMS response time data presented in this report do have some limitations. Within this report, data are presented for CY 2000 (the most complete data available at this time). Data presented within this report are the minimum known number of transports for suspected cardiac events (some may go unreported). This information represents only response times for suspected cardiac events (including chest pain, myocardial infarction, and cardiac arrest). While these data do not represent stroke, it is our belief that response times for stroke may be slightly higher since stroke is a lower priority response than check pain in many Nebraska communities.

## Behavioral Risk Factor Surveillance System (BRFSS)

The BRFSS is a cross-sectional random digit dialed telephone survey of Nebraska adults 18 years of age and older. This survey, which is conducted in all 50 states, the District of Columbia, and three U.S. territories, is developed each year by the CDC and administered by the Nebraska Health and Human Services System. Nebraska began conducting the BRFSS in 1982, and since has conducted the survey on an on-going annual basis. The Nebraska BRFSS is designed to collect information on the health behaviors of adults related to the major causes of morbidity and mortality in the state. This report contains data collected during the years of 1989 to 2002. BRFSS data are weighted to reflect the Nebraska adult population. Subsequently, all BRFSS percentages in this report represent weighted data while all n values represent the un-weighted sample size. If additional information regarding the methodology behind the BRFSS is desired, visit the CDC website at <http://www.cdc.gov/brfss/> or contact the Nebraska BRFSS coordinator at 402-471-0516.

## Minority Over-sample Behavioral Risk Factor Survey

Beginning in 2001, the Nebraska Health and Human Services System began conducting an additional BRFSS targeted specifically at minority residents. This survey, identical to the statewide BRFSS used during the same year, is limited to residents of census tracts that have a minority population of greater than 50 percent. For this report, all responses from the BRFSS and the minority over-sample survey

were combined to increase the sample for each race/ethnicity. Data from the minority over-sample survey were only reported when presenting data by race/ethnicity. If additional information regarding the methodology behind the minority over-sample survey is desired contact the Nebraska BRFSS Coordinator at 402-471-0516.

## 2001 Nebraska CVD Survey

From July to December 2001, data were collected from 1,200 Nebraska adults about their health behaviors, attitudes and beliefs, prevalence, and barriers related to CVD. This study collected information on a cross-section of Nebraska adults, aged 18 years and older, using random digit dialed telephone methodology. The survey was administered by the Behavioral Risk Factor Surveillance System of the Nebraska Health and Human Services System. Once collected, all data were cleaned and weighted (using the CDC weighting scheme developed for the BRFSS) to reflect the Nebraska adult population for CY 2001.

## 2003 Nebraska Adult Tobacco/Social Climate Survey

This study, funded by the Tobacco Free Nebraska Program, collected information on a cross-section of Nebraska adults, aged 18 years and older, using random digit dialed telephone methodology. The Behavioral Risk Factor Surveillance System of the Nebraska Health and Human Services System administered the survey. Data were collected from 7,019 Nebraska adults between January and December of 2003. Data were analyzed, in large part, by the Bureau of Sociological Research at the University of Nebraska-Lincoln while some analysis was conducted within the Nebraska Health and Human Services System.

The Tobacco Free Nebraska Program allowed the Nebraska CVH Program to add several question to the survey. These additional questions asked about television viewing and computer use as well as walking related behaviors. The survey included a sample of 7,019 Nebraska adults. Once collected, all data were cleaned and weighted (using the CDC weighting scheme developed for the BRFSS) to reflect Nebraska's adult population from 2003.

## Youth Risk Behavior Survey (YRBS)

The Youth Risk Behavior Survey (commonly referred to as the YRBS) is part of the National Youth Risk Behavioral Surveillance System that was established by the Centers for Disease Control and Prevention (CDC). The focus of the YRBS is on priority health-risk behaviors (those health-risk behaviors that are established during youth and result in the most significant mortality, morbidity, disability, and social problems during both youth and adulthood).

Nebraska began conducting the YRBS in 1991, and has conducted it every odd calendar year since. This surveillance system targets youth enrolled in grades 9-12 attending public schools in Nebraska. Data are collected by having students complete hard copy surveys in Nebraska schools that were selected through a three-stage cluster sampling design.

Data from 1991, 1993, and 2001 are considered representative of the population, and are subsequently weighted to reflect the 9-12 grade public school student population in Nebraska. Due to an insufficient response rate on the 1995, 1997, 1999, and 2001 surveys, data were not weighted and as a result, are not generalize-able to the population (according to the CDC's criteria). For additional information on the Nebraska YRBS, please visit the following website <http://www.cdc.gov/HealthyYouth/yrbs/index.htm> or contact the Nebraska YRBS coordinator at 402-471-2101.

## Nebraska Middle School Youth Tobacco Survey (YTS)

The Nebraska Middle School Youth Tobacco Survey is used to identify tobacco use from a representative sample of Nebraska students in grades 6-8. The 1999 Middle School Youth Tobacco Survey is based on responses of 3,429 students and the 2002 survey is based on responses of 2,812 students.

## Nebraska School Health Education Profile Surveys (SHEPS)

The School Health Profiles, developed and coordinated through the CDC, are designed to help state and local education and health agencies monitor the current status of school environments related to health and health education. Nebraska began conducting the SHEPS in 1994 and has been conducting it every even calendar year since.

The sample consists of Nebraska public schools serving students in any of grades 6 through 12. The SHEPS consists of data from two questionnaires, one completed by the school principal and one completed by the lead health education teacher within a particular school. Questionnaires are mailed to the principal, who then designates the school's lead health education teacher to complete the teacher's survey. The 2002 Nebraska SHEPS data were weighted to represent all public schools serving grades 6 through 12 in Nebraska. For additional information on the SHEPS please visit the following website <http://www.cdc.gov/HealthyYouth/profiles/index.htm> or contact the Nebraska SHEPS coordinator at 402-471-2101.

## 2000 Nebraska School Administrator Survey

In November 2000, the Tobacco Free Nebraska (TFN) Program sent a questionnaire to the principal within all 449 public middle and high schools in Nebraska. The TFN Program allowed the Nebraska Cardiovascular Health Program to add questions to the survey specific to physical activity and nutrition. The TFN Program used a multi-stage mailing and follow-up telephone calls to obtain an 87 percent response rate. Additional methodology information can be obtained in the report entitled *2000 Nebraska School Administrator Survey* which is available on-line at <http://www.hhs.state.ne.us/srd/00SAS.pdf> or by calling (402) 471-2101.

## 2002/2003 Nebraska Youth Height and Weight Data

In June 2004, the Nebraska CVH Program released a report on the body weight status of Nebraska students in grades K-12, entitled "Overweight Among Nebraska Youth: 2002/2003 Academic School Year." These data represent the heights and weight of more than 40,000 Nebraska students in grades K-12 from 234 Nebraska schools. Data were weighted to the 2002/2003 Nebraska school membership (census) data from the Nebraska Department of Education. A full copy of this report (containing detailed methodology) can be obtained at the following website <http://www.hhs.state.ne.us/hew/hpe/cvh/overweightamongneyouth.htm> or by calling (402) 471-2101.

## 2003 Nebraska Walk-to-School Day – Walkability Checklist

As part of the 2003 Nebraska Walk-to-School Day event, walkability checklist surveys were given to all students and parents that participated in the event at a school who received mini-grant funding from the Nebraska CVH program. The student results, presented in this report, only represent the 1,417 Nebraska students in grades K-12 that participated in the 2003 Nebraska Walk-to-School Day event at their school. Results are not intended to be representative of all Nebraska students in grades K-8.

## Significance Testing

All statements within this report highlighting differences between two populations reflect statistically significant differences (where p<.05 unless noted). Within this report, differences between rates and percentages were tested for significance using different tests.

To compare differences between percentages, the z-test for independent proportions was administered. Significance was determined at the .05, .01, or .001 level using the z-critical values of 1.96, 2.576, and 3.30 respectively. Significance tests were not administered on any subpopulation with a sample size of less than 30 cases.

To compare two age-adjusted rates, 95% confidence intervals were calculated for each rate and examined for an overlapping difference (which determined non-significance). Non-overlapping confidence intervals signified a significant difference between the two rates. Significance tests were not administered on any subpopulation with a sample size of less than 20 events. The formula used to calculate 95% confidence interval ranges for age-adjusted rates is as follows: $R \pm (1.96 \times S.E.)$; where S.E.=R/SQRT(N); R=age-adjusted rate and N=number of cases.

To compare two crude rates, different tests were used depending on whether or not the rates were dependent or independent and on the number of events within each population. When either of the crude rates was based on a number of events between 10 and 99, formula 1 was used. When both of the crude rates were based on 100 or more events, formula 2 was used. If either of the crude rates was based on less than 10 cases, the significance test was not performed. The significance tests for comparing crude rates can be viewed at <http://www.dsf.health.state.pa.us/health/cwp/view.asp?q=235686>.

## Urban and Rural Analysis

Nebraska is a sparsely populated state, with the majority of the State's population clustered along the eastern edge of the state. This dense population results in a large number of rural communities across the state. As a result, for data interpretation purposes, Nebraska's counties were divided into four urban and rural categories. The categories are based on city size within each county (which was obtained from the 2000 U.S. Census). Urban/Rural data within this report are presented for all four categories or for the urban-metropolitan counties compared to all other counties (depending on sample size limitations or the variable under observation).

*Urban Metropolitan counties* have a city with at least 50,000 residents and a county population of at least 100,000. There are 3 urban metropolitan counties in Nebraska.

*Urban Non-Metropolitan counties* do not meet the metropolitan county requirements, but do have at least one city with a population of 10,000 residents or greater. There are 11 urban non-metropolitan counties in Nebraska.

*Rural-Large counties* do not meet the urban non-metropolitan county requirements, but do have at least one city with a population of 2,500 residents or greater. There are 27 rural-large counties in Nebraska.

*Rural-Small counties* do not meet the rural-large county requirements, thus they do not have any cities with a population of 2,500 residents or greater. There are 52 rural-small counties in Nebraska.

Below are the Nebraska counties per urban/rural category for the analysis presented in this report.

**Urban Metro**
DOUGLAS
LANCASTER
SARPY

**Urban Non-Metro**
ADAMS
BUFFALO
DAKOTA
DAWSON
DODGE
GAGE
HALL
LINCOLN
MADISON
PLATTE
SCOTTS BLUFF

**Rural-Large**
BOX BUTTE
BUTLER
CASS
CHERRY
CHEYENNE
COLFAX
CUMING
CUSTER
DAWES
HAMILTON
HOLT
JEFFERSON
KEARNEY
KEITH
KIMBALL
MERRICK
NEMAHA
OTOE
PHELPS
RED WILLOW
RICHARDSON
SALINE
SAUNDERS
SEWARD
WASHINGTON
WAYNE
YORK

**Rural-Small**
ANTELOPE
ARTHUR
BANNER
BLAINE
BOONE
BOYD
BROWN
BURT
CEDAR
CHASE
CLAY
DEUEL
DIXON
DUNDY
FILLMORE
FRANKLIN
FRONTIER
FURNAS
GARDEN
GARFIELD
GOSPER
GRANT
GREELEY
HARLAN
HAYES
HITCHCOCK
HOOKER
HOWARD
JOHNSON
KEYA PAHA
KNOX
LOGAN
LOUP
MCPHERSON
MORRILL
NANCE
NUCKOLLS
PAWNEE
PERKINS
PIERCE
POLK
ROCK
SHERIDAN
SHERMAN
SIOUX
STANTON
THAYER
THOMAS
THURSTON
VALLEY
WEBSTER
WHEELER

## Socioeconomic Status (SES)

Data on both education and income are available within the BRFSS, 2001 CVD Survey, and 2003 ATS/ Social Climate Survey. Given the positive correlation between education and income, these variables were combined to create a proxy measure for socioeconomic status. The following definitions were used to categorize individuals as having a low, medium, or high education and income: individuals with a *low education and income* have an annual household income of < $25 thousand per year and have < a high school education; individuals with a *medium education and income* do not qualify for either the low or high categories; individuals with a *high education and income* have an annual household income of > $35 thousand and were educated beyond a high school (counting any amount of formal education beyond high school). These definitions were selected because they provided a large enough sample within each of the categories for valid comparison.

## Years of Productive Life Lost (YPLL)

Years of Productive Life Lost (YPLL) (also commonly referred to as 'years of potential life lost') is a measure of premature mortality within a population. According to the National Center for Health Statistics, YPLL is presented for persons less than 75 years of age because the average life expectancy in the United States is over 75 years. YPLL-75 is calculated using the following eight age groups: under 1 year, 1-14 years, 15-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, 65-74 years. The number of deaths for each age group is multiplied by the years of life lost, calculated as the difference between age 75 years and the midpoint of the age group. For the eight age groups the midpoints are 0.5, 7.5, 19.5, 29.5, 39.5, 49.5, 59.5, and 69.5. For example, the death of a person 15-24 years of age counts as 55.5 years of life lost. Years of potential life lost is derived by summing years of life lost over all age groups. Within this report, YPLL is presented for numerous causes of death. ICD codes for those causes of death are available in Table 1.